INFORMATION FOR DEVELOPMENT RESEARCH

The First Seven Years of the IDRC Information Sciences Program

by

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FOREWORD (written on the assumption that the inside cover will carry an extract from the Act)

The International Development Research Centre was established to support research into the problems of developing regions, that is, it helps to generate new knowledge in areas that have not received sufficient attention in the past, particularly in the colonial era. From the outset, however, it was realized that the world already possessed much knowledge that would be pertinent to these problems if only it could be harnessed. The Information Sciences Division of IDRC is devoted, therefore, primarily to the application of existing knowledge to development research. The Act establishing IDRC specifically empowers us to undertake certain information activities, and in fact we are one of the few aid organizations in the world which has a division devoted to information work instead of dispersing it among a variety of sectoral and often unrelated activities. Our budget in the fiscal year 1977/78 amounted to $5 776 000 of which $3 580 000 was appropriated for external projects, $1 113 000 was spent on information activities within the Centre, and $247 000 was spent outside the Centre in identifying and developing new projects.

Information pervades all research, and we therefore had to find areas of concentration to avoid spreading our budget thinly and

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with little effect. It is natural that our areas of interest have been mainly those of our sister divisions (Agriculture, Food and Nutrition Sciences, Social Sciences and Human Resources, and Health - formerly Population and Health - Sciences), whose subject experts can help us establish needs and set priorities. We also look for projects that will fit into a greater structure, have a multiplier effect and promote the exchange of information among nations, rather than fund a medley of isolated activities that would leave little to build on when our grants ceased. Many of our projects, therefore, are connected with the international information systems being developed by various United Nations agencies, which provide an overall framework, assure continuity, and permit developing countries to participate equitably.

This monograph is devoted primarily to bibliographic information systems. Most of the examples have been taken from projects receiving IDRC grants. There are, of course, many international information systems of importance to developing countries, with which we are not yet involved. We are also working in areas other than bibliographic systems - in training industrial extension engineers, in interpreting satellite data and compiling maps for development, in publishing a family health magazine for francophone Africa. But most of our budget has so far been devoted to

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bibliographic activities and we expect this preponderance to remain for some years. Bibliographic work is often more tractable than other information activities, there is a long tradition of libraries and literacy in industrialized countries which we can draw upon, and developing countries are now producing an increasing flow of librarians, documentalists and information scientists.

The true results of our program so far are very difficult to assess. Certainly the rapid growth of industrialized societies has been due in no small measure to literacy, mass education, public libraries, newspapers and journals, and radio and television; and "big science" programs like nuclear energy, space research, and computer development have all found sophisticated information systems essential. Information systems are expensive (though less expensive than not having them!) and someone has to pay the bill. It is easy to count the documents captured by an information system, a little more difficult to count the users of the system, much more difficult to count the people who do not use the system but ought to, and very difficult indeed to measure the value of a piece of information made available at the right time at the right place to the right person and in the right form. Quantitatively this may be impossible, but in an era of rampant inflation and dwindling budgets, we expect to be paying increasing attention to evaluating what we have achieved so far.

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INTRODUCTION

Information is now widely looked upon as a world resource that should be available to all nations and in the equitable manner expressed in the declaration of the New International Economic Order. This is the spirit behind our Information Sciences program. Helping developing countries to tap this resource may be one of the most useful forms of aid in the long run, with a multiplier effect reaching out far beyond that of the more traditional activities of large construction projects and vast transfers of money. With the right information, developing countries can set their own priorities, draw up their own plans, and undertake their own research to solve their own problems.

But information, particularly scientific and technical information, is expensive to produce. Laboratory research needs costly equipment, agricultural research needs land and time, scientists' and technicians' salaries are high. Many scientific papers now cost several hundred thousand dollars if all the hidden costs are included. The information needed by planners is equally expensive. Nevertheless, all information has been produced because someone thought it was worth it. Resources were allocated that could have been used for something else. Lack of information can be

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even more expensive as the many examples of unintentional duplication in science and technology and the avoidable blunders of military intelligence clearly show. Planning without the necessary facts can be disastrous.

By information we mean a piece of recorded knowledge - a scientific paper drawing conclusions from basic data gathered by the senses or by scientific instruments, a review analyzing previous knowledge, a program of activity, or a plan. Any record of knowledge is called a document, which can mean a paper in a journal, a book, a report, a gramophone record, a film, or even a scribble on the back of an envelope. This is not to say that all documents are valuable. Though information is recorded in documents, not all documents contain information; but systems that control documents give the reader a choice. He, after all, knows what is important to him.

We often hear of an "information explosion" and there is some truth in this journalistic hyperbole. In sciences that were once the preserve of a few scholars in continual communication with each other, it is now physically impossible for one man to read everything that is now published. Bureaucracy thrives on paperwork and administrators' in-trays become increasingly overloaded.

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In industrialized societies libraries and information systems have improved the flow of information to where it is needed, but they are certainly not panaceas. In developing countries, the problems are much more severe, and to understand how developing-country research is hampered, we need to consider first how the Western situation came about.

GROWTH OF SCIENTIFIC AND TECHNICAL LITERATURE AND ITS PROBLEMS

If we confine ourselves to the more formal scientific literature, we find that there is no "information explosion". The situation is no less serious, however. Present-day scientists are faced by an overwhelming mountain of paper but it did not appear suddenly. What we see today is the result of an accumulation that began in Europe with the Renaissance and since than has simply obeyed the laws of compound interest. Scientific activity - and one of its indicators is the number of scientific papers produced per year - has doubled roughly every ten to fifteen years at least since Newton's time, a growth rate of 8 to 10% per year, which, surprisingly has not been affected much in the long run by two world wars.

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The practice of recording scientific information is very old. Prehistoric man drew animal pictures on the walls of his cave, perhaps for artistic reasons, but the result is information that we draw on today. Archimedes and Euclid wrote down their thoughts; da Vinci and Galileo coded their records to avoid plagiarism or religious persecution. Groups of scholars communicated with each other in the lingua franca of the Middle Ages, Latin, and were able to travel to join the schools surrounding eminent scholars. Later, scientific societies were set up in various countries.

Widespread distribution of scientific literature had to await the printing press, which made the journal possible. It is generally recognized that the first scientific journal was the *Journal des Sçavans* in France, closely followed by the *Philosophical Transactions of the Royal Society* in England, both of which were first published in 1665. Since then, new journals have been started, old journals have been split or have been replaced, and unwanted journals have died. Present day estimates of the total number of scientific and technical journals ever published are as high as 100 000, of which some 60 000 are probably still in existence.

For many years, the system of scientific journals has shown signs

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of breaking down as a result of its own success. Scientists in universities and industry believe they must "publish or perish", their promotion prospects being enhanced by a long publications list (and in some circles this is a true belief). Darwin's *Origin of Species* would today appear as twenty or thirty separate papers. Refereeing, the editorial practice of asking an appropriate expert to comment on the worth of a submitted paper before a journal accepts it for publication, has maintained the quality of the reputable journals, but a submitted paper may now take as long as two years to get through the publication queue and into print. Papers rejected by the quality journals may be hawked by their authors around a variety of lower quality journals that have sprung up with rapid publication as their main purpose. Costs of publication are continually rising, and many journals have resorted to page charges as high as $100 per page levied on the authors' institutions. Subscriptions are correspondingly high, encouraging photocopying in place of purchases and causing the publishers to react with tighter copyright stipulations.

Nevertheless, journals remain the mainstay of scientific publication and journal subscriptions devour the bulk of most libraries' acquisitions budgets.

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A new form of literature now takes up a significant part of many research library collections, particularly in the applied sciences and technology. This is the technical report, a single piece of writing issued by the author's parent institution and often identified by a serial number of letters and figures. The practice grew in the Second World War, when vast quantities of technical information produced for government projects like the atomic bomb had to be kept under military security. When the material was released for general dissemination, it was too much for the established journals to handle. The practice of issuing reports, to avoid journal publication delays, for restricted distribution, or to meet the terms of a contract, has grown ever since, particularly as research has tended to become mission-oriented and to involve massive governmental investment in all countries. In the U.S.A., government-produced information is in the public domain; government reports are announced in special bulletins and can be readily obtained through a clearinghouse. Unfortunately, such control is rare; many governments and many United Nations agencies all issue both numbered reports and unnumbered mimeographed documents in great disarray with no easy way for the future reader to identify and obtain them. Many governmental organizations cannot trace descriptions of work they have already funded, and the outsider in search of information

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has a virtually impossible task.

Even in disciplines like chemistry and physics, where there is good bibliographic control, there are literally thousands of journals and reports. Despite the unfortunate "compartmentalizing" of science, in almost no field can a scientist read all the papers that might be useful to him. He probably subscribes to only a couple of journals himself, and regularly scans no more than ten more in his laboratory library. Much potentially important information thus escapes him if he tries to rely entirely upon his own reading. Some hope is found in abstracting journals, which first appeared in 1714. They were developed in the eighteenth and nineteenth centuries for the natural sciences, but now are used in many fields, scientific and non-scientific. Such journals contain abstracts or summaries of papers in a defined subject field and are compiled by teams scanning thousands of documents. *Chemical Abstracts*, for example, captures 360 000 documents per year. The abstracts are arranged in categories according to the readers' interests. The individual then has a better chance of keeping up with the literature in his field by regularly scanning a few sections of a few abstract journals. He may not even need to do this, as most abstracting journals are now provided with indexes to the subjects and authors of their contents, for each

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issue, each year or a period of years. Computer techniques are now widely used to speed the production of abstracting and indexing journals, and in North America and Europe large companies have bought the machine-readable files to make them accessible by telecommunications. Anyone with a computer terminal and a telephone can now search through the references to millions of documents in a few minutes.

Such is the state of the scientific, technical, and official literature. It constitutes a vast stockpile of information which has been recorded as the basis for future knowledge, and stored in a variety of libraries, documentation centres, printers' warehouses, and private collections. Man is distinguished from the animals by his ability to transmit knowledge; each generation does not have to begin with a blank mind. How can developing countries use this vast resource? Does it contain what they seek? Can they contribute to it? What are the problems and are developing-country problems different from those of industrialized countries? The answer to the last question is undoubtedly yes.

Firstly, developing-country libraries are usually poor. Most literature is good value if it is really needed, but acquiring it is an expensive business far beyond the reach of many library

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budgets. In addition, most scientific and technical research requires information generated outside any one country, and most commercially published literature, therefore, requires scarce foreign exchange. The keys to it, especially the abstracting journals, may absorb many thousands of dollars annually. Similarly, the developing countries' access to the computerized information systems of the West is limited or non-existent. Many developing-country libraries, therefore, cannot afford even the basic selection tools that would enable them to spend their acquisitions budgets wisely.

Secondly, relatively few scientific journals are published in developing countries. The principal reason is again one of cost, but the low prestige of new journals inhibits the large circulations that might give economies of scale. Scientists are attracted by journals with established reputations, and developing-country scientists are no exception. Their few local journals, therefore, tend to receive second-best papers, but all too often scientific work is recorded only in mimeographed documents that are not available to libraries and are soon forgotten.

Thirdly, many developing countries have not yet developed an infrastructure to enable them to coordinate their disparate information

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activities and make the optimum use of scarce resources. Co-operation among libraries is hampered by slow communications, lack of basic lists of institutions and collections, incompatible working methods, and limited equipment.

Finally, and perhaps most importantly, there is an effect upon the individual himself. Many scientists may never have learned how to use libraries and information services properly. Even if they have, poor library services soon dampen enthusiasm and encourage research without relevant information and without the bother of searching the literature to ensure that the work has not already been done elsewhere. What is the point of looking for references to documents that prove to be unobtainable? Developing-country libraries in general are infrequent customers of the foreign suppliers of photocopies, but this seems as much due to low demand from their own clients as it is to budgets and foreign exchange.

There are, thus, vicious circles within circles in the flow of information to and from developing countries, which have not yet been broken. A significant factor in this failure is the concentration of aid agencies upon topics like agriculture, or upon technical assistance projects, or upon providing equipment from

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their own countries. But some aid agencies and governments are beginning to realize the importance of information problems in their own right, and the information is now becoming a vogue topic at international conferences and within the United Nations organization. The last decade has shown the serious repercussions of the information problem for developing countries, but also that there is reasonable cause for optimism.

INTERNATIONAL BIBLIOGRAPHIC INFORMATION SYSTEMS

The last ten to fifteen years have seen a movement that augers well for the developing-country problems just described. Most development projects are part of a mission - how to feed, clothe, and house the poor peoples of the world; how to provide the benefits of better health and better education; how to control population growth to reasonable levels; how to preserve the environment; how to provide better transport. Most missions in all countries involve governments at one level or another. The new information movement is to serve such missions by the building of international cooperative information systems often involving governments. It began with the very specialized mission of harnessing the atomic nucleus for peaceful purposes, but has now

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been extended to agriculture, population, education, aquatic sciences, architecture and human settlements, the environment, and industrial technology.

INIS - the International Nuclear Information System

In the late 1960s, the member governments of the International Atomic Energy Agency (IAEA) agreed to set up the International Nuclear Information System (INIS), as even the U.S.A. and the U.S.S.R. were finding it impossible to handle the world's nuclear literature themselves. INIS has subsequently grown into the world's major source of nuclear information, capturing about 90 000 documents each year.

The principles of INIS are relatively simple. Each country sets up a centre to collect all the documents produced within its borders dealing with a precisely defined subject scope. It describes each document bibliographically according to common rules, adds indexing terms, and records the data on a worksheet or on magnetic tape. An abstract is provided in one of the official IAEA languages, plus a copy of the original document if it is "non-conventional" and cannot be obtained through normal commercial

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channels. The IAEA uses a computer to merge the data from each country into a file of the world's information, which is returned to each participating country in return for its input. The regular additions to this file appear as a printed indexed bibliography (*INIS Atomindex*) and a magnetic tape, which each country has the right to use as it sees fit. There are no copyright restrictions. Extra copies of *INIS Atomindex* can be bought for local currencies through IAEA sales agents, and copies of the non-conventional literature can be requested from the IAEA. Abstracts are now routinely included in *INIS Atomindex* and on the magnetic tapes.

If we look closely at INIS to see what can be copied for other missions, we can identify several important components.

1. It is an inter-governmental system. Member governments agree to adhere to operating rules laid down by a co-ordinating centre. They set up national cooperating centres provided with the necessary staff and facilities, and appoint liaison officers, who participate in the system's development and agree to its rules.

2. As the system is decentralized, every participant must

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work compatibly with the rest. The tools needed for compatible operation - the subject scope, the worksheets, the guidelines for completing them, the thesaurus, the magnetic tape formats - are provided by the international coordinating centre, which also trains national staff and informs them of their mistakes.

3. The subject scope of the system is most important. Each topic covered is described in such a way that an inputter can take a document and quickly say whether it belongs within the system or not. The subject scope also tells the user what he may expect from the system.

4. Each country inputs only the documents issued within its boundaries, that is it does the work it is most suited to do. This territorial formula avoids duplication, ensures a fair distribution of cost and effort, and clearly defines where each country's commitments end. The costs of the national centre are roughly proportional to the size of the country's program; and each country must organize its own literature anyway if it is to direct its research effectively. Thus the equity sought in the declaration of the New International Economic Order

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is achieved.

5. The system provides copies of the documents input, at least for the non-conventional literature.

6. The system is not static; it has been improved over the years to meet the criticisms, suggestions, and requirements of its participating countries expressed through regular meetings of liaison officers.

7. A "carrier" language or languages are necessary. In INIS titles in the original language must be accompanied by an English translation and indexing is done in English. Other systems have found this too restrictive, but are still confined to only one or two languages.

8. Regular outputs are provided to suit both rich (magnetic tape) and poor (printed index) countries, who can then design their own information services for their own needs. In INIS the total world file is distributed in this way but systems handling information pertinent only to particular regions may divide the file in some way.

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These components could probably not have been put together without the IAEA's leadership, and it is difficult to see how similar mission-oriented systems could be planned and operated without an involvement of the appropriate United Nations agency. INIS is in a highly specialized subject area and undoubtedly has special features, but, with appropriate modifications, INIS is now being successfully copied for other missions.

AGRIS - the International Information System for the Agricultural Sciences and Technology

The INIS model was next applied to agriculture, a mission with considerable differences from nuclear energy. Agriculture has been practised for millenia. A large variety of institutions carry out agricultural research and training. In most countries, there is no one organization that can immediately coordinate all agricultural information activities, not even within a ministry of agriculture. The users of agricultural information are spread over a broad spectrum, including the millions of people, literate and illiterate, who do the actual farming. Even the word "agriculture" has different meanings in different languages. It is estimated that a quarter of a million agricultural documents are produced per year, some of it inapplicable outside a particular

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geographic or climatic region, much of it recorded only in a vernacular language. A plethora of information services exists at present (over 600 according to one study), some trying to handle the world's agricultural literature, others confined to single crops, with much duplication but also with deficiencies.

Nevertheless, the Food and Agriculture Organization of the United Nations (FAO) thought the INIS example sufficiently encouraging to follow, and the International Information System for the Agricultural Sciences and Technology (AGRIS) went into regular operation in the beginning of 1975. Since then, AGRIS has succeeded in capturing a major proportion of the world's agricultural research literature - at present 16 000 items per month - including significant quantities of non-conventional material missed by other information services. The AGRIS Coordinating Centre has followed INIS procedures very closely (to the extent of using the INIS computer and arranging joint INIS/AGRIS training courses) so that files can be exchanged easily on magnetic tape between the two systems (and, hopefully, future systems).

Note: Check at galley proof stage

The INIS experience certainly enabled AGRIS to start quickly, but led to the over-stringent input requirement of input only on magnetic tape to reduce the keypunching load on the Coordinating

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Centre. As many countries cannot yet meet this requirement, IDRC for three years funded a small unit to produce magnetic tape from worksheet input from developing countries. Initially, the data had to be keyboarded, but this effort is now avoided. It has been successfully shown that typed worksheets from institutions in a variety of countries can be prepared consistently to the quality demanded by optical character recognition machines, which themselves read typed characters and record them on magnetic tape. This demonstration is perhaps one of our best investments, which will benefit many international systems. All an inputting centre needs is a typewriter carrying the typefont that the machines can read.

Several groups of governemnts have agreed to participate in AGRIS through regional input/output centres, two of which are in developing countries. With IDRC assistance, the Inter-American Centre for Agricultural Documentation and Information (CIDIA) in San José, Costa Rica, on behalf of the member governments of its parent organization, the Inter-American Institute for the Agricultural Sciences (IICA), has established a regional agricultural information network known as AGRINTER, and acts as an intermediary between their national information centres and AGRIS. In Southeast Asia, IDRC is supporting a similar regional centre

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known as the Agricultural Information Bank for Asia, which is located at the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), a regional organization under the umbrella of the Southeast Asian Ministers of Education Organization. There are obvious advantages in such a grouping. Scarce human resources are used most efficiently and it is easier to arrange training courses for people speaking the same language, having the same agricultural interests, with shorter distances to travel, who are likely to share common experiences and problems.

Both regional centres have governmental backing, and both would have a role in their own right even if AGRIS did not exist. Both have begun by collecting documents from national centres, whose staff are being trained to complete worksheets themselves. This literature, which includes material such as extension literature outside the AGRIS scope but pertinent to the region, is listed in regional bibliographies, *Índice Agrícola de América Latina y el Caribe*, which is indexed in Spanish and *Agriasia*, which is indexed in English. In both centres computer techniques have been developed to produce the regional bibliography and the AGRIS input in one machine process selecting from the one collection of worksheets. The machine-readable regional file and the AGRIS file can be searched by computer for literature references as a

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regular announcement service or in answer to specific requests. The documents themselves are provided as photocopies, and both centres are now investigating microfilm as a means of speeding document delivery and lowering costs.

Population Information Systems

For population information, regional systems are developing faster than a global one, possibly because the location-specific nature of documents in this subject area emphasizes the advantages of regional information exchange. An international Population Information System (POPINS) was proposed in 1975, and in 1976 a feasibility study was carried out by a small team (including an IDRC staff member) working under the auspices of the United Nations Population Division. Though further study would be needed to complete the final design - particularly a detailed subject scope, an assessment of the total volume of literature within this scope, and a better picture of the sources and users of population information - the team was able to sketch a world system. It was not dissimilar from AGRIS but was more properly described as a program as it depended very much on strengthening regional centres.

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Meanwhile, in Latin America, the leadership has been assumed by the Latin American Demographic Centre (CELADE), a regional organization associated with the United Nations Economic Commission for Latin America (CEPAL) and responsible for executing the United Nations Latin American Regional Population Program. CELADE's program is approved by a council representing governments and it is therefore a logical starting point for developing a regional documentation system to serve Latin American population institutions, the majority of which have poor access to libraries and other information services. The Latin American Population Documentation System (DOCPAL) has as subject scope the broad field of population, including the formal demographic aspects of population, population fields related to social and economic development, and population policies and programs, but excluding clinically oriented papers. DOCPAL is collecting publications and other documents from population institutions throughout the region and is using a computer to organize the bibliographic records in much the same way as INIS and AGRIS. In addition to the indexing terms taken from a thesaurus (a structured list that may eventually be incorporated in a POPINS thesaurus), informative abstracts are being written in Spanish and are being stored in the computer in natural language form. The output is an indexed bibliography, *DOCPAL Resúmenes sobre Población en América Latina*,

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which is reproduced by normal printing methods and distributed back to the participating institutions. Arrangements are being made to provide copies of original documents on request. Eventually, as in AGRINTER and AIBA, much of the work will be decentralized to participating institutions in other countries, a start having been made with a small IDRC grant to the Fundación de Desarrollo en América Latina for a pilot project to process documents from two Argentinian provinces.

In West Africa, we have just given a grant to the United Nations Regional Institute for Population Studies (RIPS) to develop a Population Information and Documentation System for Africa (PIDSA). PIDSA will closely follow DOCPAL methodology but will contain French abstracts of French documents as well as English abstracts of English. Initially it will be a manual system but mechanization will be introduced after the first year using the same computer system as DOCPAL so that files may be exchanged on magnetic tape. If this pattern is followed in other regions, it is easy to visualize a POPINS-type of system evolving, perhaps with regional files instead of one global file like AGRIS and INIS.

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Water Supply and Sanitation

Rural water supply and sanitation has been identified as a priority area by IDRC and other aid agencies, and here too regional information systems are developing before a world system. Some information in this field is sociological and may not be directly applicable in regions where it was not generated. On the other hand, much information is technical and applicable almost anywhere. A world system following the INIS model therefore seems useful, but none has yet been set up despite much international discussion. One important reason is administrative: water supplies and sanitation are the responsibility of many different government departments - public works, health, agriculture, environment, national development - and the responsibility is also split among national, regional, municipal, and village levels of government. Among the United Nations agencies and the aid donors, one finds the same gallimaufry of interests. It is difficult, therefore, to find a focus for an international bibliographic system. Regionally, however, some progress is being made. With IDRC funding, the Pan-American Centre for Sanitary Engineering and the Environmental Sciences (CEPIS), an organization related to the Pan-American Health Organization, is designing a regional system to link several institutions that were all separately trying to

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build their own information services. Interest in CEPIS's plans have spread from the initial group of institutions to the rest of Latin America and other parts of the world. The Asian Institute of Technology in Bangkok, which has conducted research in sanitary engineering for many years, has just begun to add an information centre on environmental sanitation to its specialized information activities (see later). In India, the National Environmental Engineering Research Institute is planning an inventory of institutions handling relevant information. Thus the basis is being laid for exchanging information within South and Southeast Asia and with Latin America.

DEVSIS - Development Sciences Information System

Development is itself a mission, which embraces sectoral activities in almost all developing countries. It usually involves many national and sub-national institutions, and it is here that a country's own information is the most important to it. Planning and the proper allocation of scarce resources are impossible without adequate information. At the international level, there is a motley collection of United Nations agencies, bilateral donors, foundations and non-governmental organizations, all trying to make

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decisions concerning development.

Planning an appropriate information system is beset with organizational and funding problems, in addition to the technical one of defining development information in the first place. Nevertheless, the need for an information system to serve national and international policymakers, aid agencies, financiers, and all those involved in planning and managing development programs has been widely recognized and has been given priority by IDRC since the outset of our Information Sciences program. The highrise buildings of the United Nations were rapidly becoming modern towers of Babel, each agency with its own document collection organized differently so that exchange with other agencies was difficult and frustrating.

One extremely useful tool was developed when two or three United Nations and intergovernmental agencies realized that their document collections in related fields had different indexing systems with different terminology and arrangements of concepts. Thus, a document found under "Labour Codes" in one agency, might come under "Employment Legislation" in a second, be hidden under "Legal Aspects" in a third, and not be indexed under any legal term in a fourth. Without the same terminology it would be very difficult to exchange information on computer tape and to build composite

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files of extracts from the old ones (see also page 43). The Organization for Economic Cooperation and Development in cooperation with these agencies therefore drew up an Aligned Descriptor List, which was further developed into the *Macrothesaurus: a Basic List of Economic and Social Development Terms*. The *Macrothesaurus* has now been published in English, French, German, Spanish, Portuguese, Arabic, and Indonesian, and is being used by a significant number of organizations, including IDRC. All are finding through use that modifications are necessary - a thesaurus must change to accommodate new topics arising in its subject area - but steps are being taken to add terms "officially" to prevent a new generation of differing macrothesauri from being spawned. Such thesaurus management is one of the functions of the coordinating centre of an international system.

In economic and social development, an international information system has been proposed and studied in some detail. One initiative was taken early in 1974 by the IDRC in describing an outline for the Development Sciences Information System (DEVSIS). In 1975, a small team, brought together in Geneva, conducted a feasibility study under the general direction of a steering committee sponsored by IDRC, ILO, OECD, UN-ESA, UNDP and Unesco.

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The team produced a system design closely based upon the INIS model, but aimed at a much more indistinct army of users - the "development community". This includes policymakers, planners, investors, project managers, researchers, and communications specialists, all concerned with economic and social development programs and working in ministries of planning and similar government bodies, in international and regional organizations involved in development programs, in development aid organizations and in development research institutions. Consequently, the subject scope of DEVSIS was a thorny matter for debate, as were the sources and types of material within the subject scope. Limiting DEVSIS to economic and social information produced in and about developing countries would have eased the scope definition, but some potential users in developing countries claimed strongly that developed-country information can be equally important. The solution was two files, one containing the indexed records of documents dealing directly with questions of the economic and social development of developing countries, the second containing indexed records describing the sources of specific information and data in both developed and developing countries. The other major modification of the INIS model was to provide for input in any one of the three major international languages, English, French and Spanish, and to write a computer program so that literature searches by a term in

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one language would retrieve documents indexed by that concept in any of the three. (A similar improvement is now being added to AGRIS.)

No United Nations agency has yet been able to proceed with the DEVSIS concept, but at the regional level there is a growing awareness that only cooperation can put some order into the chaos of development documents and give a reasonable hope that the development community will ever be able to find the information it requires when it is needed and in the right form. In Latin America and in Southeast Asia, we have held meetings to make development managers more aware of the importance of complete and up-to-date information. The discussions generally reveal a large gulf between the thinking of the planners and the information specialists, but the airing of problems on both sides has been beneficial and will undoubtedly influence DEVSIS's ultimate form.

In Latin America, the Latin American Centre for Economic and Social Documentation (CLADES), planning with DEVSIS in mind, has been compiling an inventory of institutions in the region that can provide development information services to a clientele outside their own immediate staff. For this, its staff have visited national centres able to conduct national surveys, and have worked

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out with them a suitable questionnaire. CLADES is building a computer file from the results, describing the national information infrastructure, as it is called. A second experimental file contains records to development documents produced by CEPAL, Andean Pact organizations and the Latin American Integration Agency, organizations which CLADES has trained in its methods of document description. There are already clear indications that a regional network is a reasonable expectation, in Latin America, and later in Southeast Asia, which is also following a similar path, beginning with a directory of sources of development information produced by the the U.N. Asian Development Institute.

DOCUMENT DELIVERY

International information systems of the type described so far do not immediately provide the user with the information required. They are citation systems; when their files are searched for answers to a question, the result is a list of references - titles, authors' names, and publication data - to documents that are likely to contain the answer. They rarely provide the documents themselves, and then only with a delay. This is not a new problem, but is a feature of most indexes, abstracting journals and machine-

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readable data bases. Indexes and abstracting journals have long been sold as separate entities, and now in North America, Europe and a few developing countries the data have been computerized and several million bibliographic references are accessible using dial-up terminals and cheap telephone links. But however he selects the references, the user himself has to find the documents he thinks he needs, that is, he then has to approach a library or document collection. Nevertheless, abstract journals, indexes and computer-based search services survive because people find them useful enough to pay for them. In developed countries, commercial citation services flourish, but on the other hand, even with international systems developing-country users find great difficulty in obtaining copies of the literature they require for their work. Why is this?

Libraries

Most Western countries have a long tradition of libraries, both private and public, which the commercial citation services take for granted in their operations (and generally do not pay for). Some, like the Institute of Scientific Information, do provide scientific papers (torn from actual journals to avoid copyright

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infringement) and also record the addresses of authors, who can be asked for reprints. But most of them do not need to do this. Their clients are used to libraries, particularly in countries where public libraries grew out of the working class literacy movements of the industrial revolution, and where scholarly, research, administrative and public institutions are well endowed with large and relevant library collections.

Libraries have always been expensive, and the time is long gone when any library could hope to meet all the needs of all its users. But in the West, postal, telephone and telex services have been put to good effect in cutting costs. Interlibrary loan networks, usually operated in a spirit of voluntary cooperation rather than by governmental edict, stretch library budgets and put a country's entire literature resources at the disposal of each individual. In IDRC, for example, we have never tried to build a library covering all the interests of all of our staff. The other libraries in Ottawa can quickly lend us most of the scientific and technical material we need, and we can spend our funds on material about development itself. Books are still lent between libraries, but for journal articles and short documents the traffic now consists primarily of non-returnable photocopies. Modern photocopying has revolutionized librarians' thinking. For example, the British

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Library has centralized the country's holdings of the older journals and sells photocopies to all comers. Consequently, U.K. libraries no longer have to maintain large bound journal collections of their own, and there are concomitant savings in premises and staff. In most countries, copyright legislation is interpreted as permitting the "fair copying" of single articles for research purposes, although publishers are beginning to take a harder stance and the free flow of scientific information could be impeded after a testing of copyright law in the courts.

Have developing-country libraries been able to keep up with these modern trends? The answer is all too often "No". When budgets are small and library collections sparse, a country's total literature holdings remain inadequate for national needs. One still hears that a particular country has only just managed to assemble a complete run of an important reference journal like *Chemical Abstracts*. Library subscriptions are limited by foreign exchange shortages, and the need for finer selectivity puts a heavier intellectual burden upon often-untrained library staff, who cannot find relief in interlibrary loans. Low budgets often go with supply problems. The many scientific journals published in Europe and North America may take weeks to reach a subscriber, particularly if he cannot afford an airmail subscription. Slow

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communications between and even within cities deter interlibrary lending.

Further discouragement is provided by the administrative practice, reminiscent of the mediaeval chained library, of holding librarians personally responsible for their collections and docking their salaries for lost books. Even when funds are not a serious problem, cooperation among libraries in many developing countries is hampered by a lack of the basic tools needed. A group of libraries wishing to provide each other with photocopies of scientific articles from their journal collections requires a union list identifying which libraries hold which journals. Such a list is being developed, for example, by the libraries in AGLINET, a library network associated with AGRIS. We have also recently approved a project to support the cooperation of a group of national libraries in Southeast Asia. Better use is also being made of the many people without formal training who find themselves running developing-country libraries, and special curricula and courses are being devised for them, for example, in an IDRC-supported project at the University of Mauritius.

Microfiche

One answer to many library acquisition problems may be the microfiche,

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a postcard-sized piece of photographic film bearing small images of up to 60 or 98 pages of the original document, together with a header strip identifying the document in characters large enough to be read by the naked eye. It is cheap, easy to use and to duplicate, can be mailed inside letter envelopes which are not delayed in customs, and can be filed just like a catalogue card. To make microfiche, cameras of varying levels of sophistication are needed according to the quality and through-put desired, but serviceable equipment adequate for many purposes is now available relatively cheaply. More importantly for many developing-country institutions relying on microfiche made abroad, simple readers that enlarge the image back to full-page size now cost as little as $100, a price at which all the user institutions in a network could be provided with at least one. Though most models depend on electric light bulbs and cannot be used on the bus to work, portable readers are available, and one that relies entirely on sunlight is being developed. Reader/printers are also becoming cheaper, and some now produce "hard" copy on ordinary paper, which is more hospitable to marginal notemaking than the coated papers used by some models. Though microfiche are less convenient than hard copy and many scientists who are used to television and computer display screens accept them only with reluctance, there is at present no better means of building developing-country libraries rapidly and

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economically.

In the present technological and economic conditions, the document delivery service which must accompany international bibliographic information systems if they are to serve developing countries effectively can be provided only by microfiche. In INIS, it is the coordinating centre that collects or makes microfiche of all the non-conventional literature input to the system. In AGRIS, where the numbers of documents are much larger, the responsibility for providing the microfiche has not yet been assigned, and *Agrindex* merely notes where each non-conventional item is available. The regional AGRIS centres at IICA/CIDIA and SEARCA, however, are both considering microfiche as the medium for providing their network institutions with documents, and in the present IDRC grant to IICA/CIDIA funds have been specifically included for this purpose.

SPECIALIZED INFORMATION CENTRES

The bibliographic systems we have been discussing so far take a macroscopic view of their subject. The large abstracting services like *Chemical Abstracts* and *Biological Abstracts* and most of the mission-oriented systems like INIS and AGRIS handle hundreds of

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thousands of references per year. The indexing must, therefore, be detailed enough to prevent the user from being referred to many documents that prove to be irrelevant when he has obtained them. Nevertheless, with numbers of this size, the indexing is inevitably shallow. It is impossible to pay much attention in the system design to the detailed needs of specific users. In very narrow fields, however, this is not an unrealistic ambition, and this is where specialized information centres have an important role to play.

A major problem in development research, and indeed one of the reasons why IDRC was established, can be turned to advantage in handling the information required. Crops provide an example. Many tropical crops are only now being improved nutritionally as staple foods, having received little attention during the Colonial era. Consequently, the relevant research is comparatively new, the research workers are few in number, and the amount of literature worth acquiring is quite small. It is, therefore, realistic to consider an information centre specializing in most or all of the literature on a particular crop and providing information specially tailored to the needs of an identifiable clientele.

In agriculture, IDRC is supporting specialized information centres

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on crops like cassava, tropical grain legumes, sorghums and millets, and coconuts and in the broader areas of African soils, and farm irrigation science and technology. Outside agriculture, we are funding centres on geotechnical engineering and on packaging, both of which are concentrating on Asian needs, a centre on ferrocement technology, which is concentrating on the developing-country applications, and a centre on environmental sanitation. We are ourselves operating a small aquacultural information service to a group of IDRC-supported projects and are compiling a regular bibliography with informative abstracts on low-cost rural health care and health manpower training.

Most specialized information centres build upon some basic activity by adding specific services to meet users' expressed needs. This essential responsiveness can be most readily achieved if the information work is in almost daily contact with the user activities of research, training and practice. The users can then immediately influence the type and quality of services being developed, and the information centre can obtain regular advice and technical help with special assignments. Thus, after a certain amount of initial stimulation, a symbiotic relationship tends to develop if the environment is favourable. It is therefore IDRC's policy to support specialized information centres only if they are located at what

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might be termed a "centre of excellence" in the subject concerned.

The initial basic information work is usually bibliographic. The Cassava Information Centre, located at an international agricultural research centre in Colombia, began by collecting all the known cassava literature. Scientists had confirmed that even older material was still valuable and the job seemed manageable - 3 000 to 5 000 documents estimated as the corpus of cassava literature. The first service provided bibliographic citations and abstracts produced as documents were acquired. At the same time, the documents were assigned indexing terms, and the records were stored against the indexing terms in a simple optico-mechanical system which enabled documents on specific aspects of cassava to be retrieved from the collection. The entire literature collection has now been preserved in a printed bibliography with abstracts and indexes, which is being kept up-to-date by regular supplements of the current literature. The International Grain Legume Information Centre, located at an international agricultural research centre in Nigeria, began on much the same lines, but is incorporating its current abstracts in a regular news bulletin. As different grain legumes are being studied in the different parts of the world where they predominate, there is the potential for a network of several information centres each specializing in only a few species and

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exchanging records and documents of common interest. A greater volume of relevant literature has caused the Sorghums and Millets Information Centre in India, to take a slightly different approach - to limit its literature collection to post 1970, and to use short annotations rather than informative abstracts. For similar reasons, the International Irrigation Information Centre in Israel, has limited its subject scope to only one aspect of irrigation, the science and practice of using irrigation water on the farm. Its current bibliography employs annotations which indicate topics omitted by papers as well as what they include.

The simple optical system used at the above crop information centres uses the same indexing methods as computer systems, so the less sophisticated system acts as an introduction to the intellectual aspects of computer searching. The information centres on irrigation, geotechnical engineering, and ferrocement already use computers and the others are considering them as their parent institutions acquire them.

A most important function of a specialized information centre is "information consolidation". Even if all relevant documents are available, the task of reading and assimilating them all before the start of a new research project may be completely daunting.

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Some guidance to the literature may be necessary in the form of a review that compares different research findings, criticizes methods, and suggests which papers are essential reading. Often a review can completely eliminate the need to refer to many documents while at the same time giving the essential information. Review writing is, in fact, a long established practice. The invitation to write a review often carries a certain amount of prestige. Other special publications of the information centre may be aimed at groups of users with particular needs. Thus agricultural extension workers can be given a pocket-sized field guide to the diseases and pests of cassava, and farmers can have a directory of suppliers of the type of irrigation equipment they need.

Some products of many specialized information centres may not be bibliographic at all. Many questions cannot be answered satisfactorily by citing documents that only may contain an answer. They must be referred to an expert, who may respond by writing a letter, making a telephone call, or even paying the questioner a visit. A list of experts in the chosen field, either institutions or individuals, can be invaluable for this referral function and both the Cassava Information Centre and the International Irrigation Information Centre have produced them.

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In research networks spread over many countries, communications may be tenuous. Here, the information centres are playing an important strengthening role by circulating newsletters that summarize current research, important findings, forthcoming meetings and conferences, staff movements, outbreaks of pests and other information which is useful only if known immediately. This is particularly helpful in agricultural research, in which the delay between starting a research project and seeing journal papers in print may be several years. Such newsletters may be simple folded sheets, like *Irrinews*, contain contributed items, like the *Cassava Newsletter*, or carry current abstracts and short scientific papers, like the *Tropical Grain Legume Bulletin*.

COMPUTERS AND BIBLIOGRAPHIC INFORMATION EXCHANGE

Computers, as their name implies, were originally developed for complex mathematical computations. However, they soon relieved the drudgery from more mundane calculations, such as payrolls, in which simple mathematical operations are repeatedly applied to a vast quantity of similar data. Later, it was realized that words could be encoded as strings of numbers and that computers were then eminently suitable for bibliographic work. For the preparation

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of large files and the retrieval of records from them, they have become indispensible. Computers, however, are not the electronic brains they are often claimed to be, but rather electronic slaves doing exactly as they are told, neither more nor less, often with unexpected results. Hence, the many systems design and programming problems that keep an army of specialists busy perfecting the slaves' instructions.

Computers do bibliographic work by comparing the strings of numbers that represent the words. The computer understands only exact matches. Thus, although human librarians can overlook spelling errors, tolerate different orders of the same words, recognize that a word is in a foreign language, and generally make reasonable interpretations of uncertainties, the computer cannot understand that John Smith, J. Smith and Smith, J. are probably the same person and that Johm Smith is an error. Programs can be written to correct common errors but even a missing full stop can cause a record to be treated wrongly. Thus the rules for inputting information into the computer must be specified precisely and in detail, and the people preparing the input have to follow them exactly. In the cooperative international bibliographic systems, in which the input is decentralized to a great many people of widely differing nationalities, mother tongues, backgrounds and experience, this

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stipulation is extremely important, which is why systems like INIS and AGRIS continually provide training.

The international exchange of computer records implies that one computer must be able to read the tapes prepared on another. To do this, each computer needs to find its way through the number strings representing the records. For this, "labels" and "addresses" are needed. Bibliographic records are broken down into the elements author, corporate author, title, journal in which an article appears, publication data and the like. Each element must be tagged with a special identity code. Again, this means that the international systems require clearly defined input formats and procedures, often embodied in a worksheet.

The two problems just referred to arise from the basic principles of the machines; a third lies outside them, and has been referred to already on page 26 in connection with the *Macrothesaurus*. If indexing terms are used in the record describing each document, they must be standardized. Thus for each system it is essential to have a standard indexing list, preferably a thesaurus of indexing terms structured to show all the concepts within the subject scope, with broader or narrower concepts, and indicating the relationships between them. The indexer then chooses appropriate

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terms to describe each document input, and is guided in this task by cross-references from synonyms to the used terms, and also by an alphabetical list of terms accompanying the hierarchical structure. Although computers can search for words in the natural language of titles, international systems tend to rely on thesaurus indexing to ensure consistency of terminology, otherwise users whose mother language is not that of the computer face enormous problems in selecting the right terms (or synonyms of them) to use for indexing and for subject searching.

In the AGRIS program particularly, we have taken pains to ensure that each agricultural information centre is provided with a thesaurus with bridging terms to an eventual AGRIS thesaurus. With computers, it will thus be possible to obtain many citations from the AGRIS tapes, and also to search the records of more than one centre using the same indexing terms to find documents to do with, say, intercropping of cassava with cowpeas, or the irrigation of chickpeas with sprinkler systems.

All of the above problems come under the broad heading of compatibility. Compatibility problems were under-estimated when many institutions rushed to apply computers in their work, but they are now fully appreciated and are being overcome by systems

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designers, who on the international scene have the encouragement of Unesco's UNISIST program of cooperation of the world's scientific information systems. Unesco and the International Standards Office, though not actually operating any of the systems described, are playing a leading world role in bringing about the required standardization. But standardization is not the only problem besetting the international exchange of information among computers. There are others more closely associated with the inner workings of the computers themselves.

Writing the computers' instructions, or programming them, is a painstaking intellectual exercise for systems analysts and programmers, who originally had to work in a "machine language" that was rigidly tied to the design of the particular machine used. "High level languages" like FORTRAN, COBOL, ALGOL and PL/1, now enable programs to be written for more than one type of machine, and programs can thus be exchanged (sometimes a little program modification is necessary) to prevent the same work from being done twice in different ways. For complicated groups of related jobs, such as all the administrative procedures in a library, sets of interlocking programs have been put together; unfortunately information people have not practised what they preach about standard terminology and these program sets are also called information

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systems.

If information is to be exchanged among a large number of computer users, it is to everyone's advantage if a common computer system is used. Although machine-readable data in a standard format should be readable on a large number of different computer systems, a common system avoids some of the necessary reprogramming (computers are, in fact, rarely identical) and more importantly enables a body of expertise to be built which combines varied experiences and can be drawn on for new applications and training. Early in its history, IDRC chose a computer system for its library and bibliographic work that was most likely to be used widely for the exchange of development information. Events have shown the choice to have been a wise one. The system is known by the acronym ISIS (standing for Integrated Set of Information Systems). It was developed in the library of the International Labour Office (ILO), to handle all the usual library housekeeping functions from the printing of purchase orders to circulation control, and makes the maximum use of each piece of information input. Thus a book title input for purchase does not have to be input again to the circulation program. In addition, ISIS provides for subject retrieval of documents in the library collection through the use of indexing terms selected from a thesaurus. Each document record in

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the computer consists of a bibliographic description in standard form, followed by a short indicative abstract containing the indexing terms embedded between slash marks within natural language sentences. The computer retrieves all documents pertaining to, for example, the effects of labour legislation upon children by looking for all the records carrying all the indexing terms for "labour", "legislation" and "children". Usually the search strategy is more complicated than this; to narrow the search to what is wanted, dates, authors' names, types of publication, languages, can be specified and unwanted aspects of a subject can be completely excluded. All of these operations are performed "on-line" at a computer terminal, which displays the results immediately; if required, a printer can record them. Printed indexes to the whole collection replace the conventional card catalogues in the library, for ready reference and for use when the computer is not switched on.

IDRC chose ISIS in the first place on technical grounds - it did the required job - but political reasons were equally important. ISIS was developed by a U.N. agency, the ILO, and was therefore available essentially free of charge to other U.N. agencies and to member governments. Several agencies handling development information were already using it, more were interested, and there

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were signs that they would all be able to use indexing based upon the OECD *Macrothesaurus* already described. ISIS was capable of further development - IDRC has modified it to print both upper and lower case letters, and to handle indexing in several languages. Finally, an important factor in 1973 when the choice was made, it would run on a medium-sized computer of the type often found in developing countries. Thus ISIS, together with the *Macrothesaurus*, could be the keys to the international exchange of development information, even before the DEVSIS proposal. Moreover, ISIS-based systems could be used with other thesauri in specific subject fields.

Many institutions are now using ISIS, and so many requested technical assistance in adopting it that we are now employing one systems analyst full-time for this purpose. He helps them with the implementation problems, trains their staff and modifies the system to their local requirements. With modifications, ISIS is being used in several of the projects described elsewhere, particularly those with links to international systems. With the assistance of our "ISIS-Outreach" man, the U.N. Economic Commission for Latin America has implemented it in Santiago, Chile, where it is being used for both DOCPAL and the CLADES activities. FAO has adopted it for its own documentation centre and for the national

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centres it is helping to establish with UNDP funding, and IDRC, in conjunction with the Latin American AGRIS/AGRINTER project, has done the program modifications necessary to enable it to read AGRIS tapes. National centres in the Philippines, Kuwait, and Mexico have received our help and others have requested it, and we are now planning ISIS resource centres in various parts of the world where computer processing of bibliographic information can be done for IDRC-supported and other projects. These centres will act as growth points in their regions.

Computer systems continually evolve, however, and ISIS is no exception. The original ILO version of ISIS was developed for a medium-sized IBM computer, which controlled its internal processing through a set of programs called a "disc operating system" (DOS) - another meaning of the word "system". ILO has since developed another version to run on the larger IBM computer at the International Computing Centre in Geneva and operating under a more efficient operating system known simply as "operating system" (OS). Large computers operating under OS are now by no means rare in developing countries, especially in the larger centres, and several organizations whom we have helped to implement the DOS version of ISIS are considering a change to the OS version. Large computers are still out of the reach of most developing-country institutions,

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however, and certainly are far too expensive to be made available through IDRC projects. We are, therefore, seeking simplicity and low costs.

Like many organizations of our size, we did not buy a large computer of our own, but instead rented time on a large computer at a service bureau. This was expensive but a more serious disadvantage was that we did not have complete control over the operation, the allocation of priorities, time for system development, and the competence of the operators. An ideal situation is to have a computer that is cheap enough to be dedicated to an information centre and under its total control. Advanced technology provides a potential solution in minicomputers. As their name implies, they are less powerful than the computers that were first developed, but computer technology is improving so rapidly that the only stationary definition is one based on cost. By minicomputers we mean those that can be bought for $100 000 - $200 000, including the peripheral equipment of tape drives, terminals, and output printers. We have bought one of these for our own internal use, but have chosen the model carefully on the basis of its availability and serviceability in developing countries. On this Hewlett-Packard 3000 Series II we have designed a multipurpose bibliographic system that has many of the features of ISIS but much more flexibility in

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the data it can accept and more power in its application.

After 18 months of design work, our ISIS system has been completely transferred from the service bureau to the minicomputer, and with a little more experience of actual operation we should be in a position to include minicomputers in present and future projects. Specialized information centres are ripe for the application of minicomputers, which will provide an immediate link to the broader international data bases. For example, the information centres specializing in certain crops will be able to extract much of the basic data from the AGRIS tapes, and a network such as on all grain legumes becomes a much more attractive proposition. Exchanging records on tape is possible now provided each institution has access to a large computer, but the minicomputer makes this idea more practicable. Appropriate technology is not always simple; in this case a leap to the latest computer technology brings with it great hope for progress.

NATIONAL INFORMATION STRUCTURES

As we have seen, the commercial and semi-commercial services in the West were designed with little regard to developing-country

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problems - low budgets, foreign exchange shortages, lack of basic library collections and trained staff, few computing facilties, language problems and different backgrounds and attitudes. The international cooperative bibliographic information systems potentially can provide a strong measure of relief, but only if developing countries really can participate in them in the true spirit of equality of the New International Economic Order.

The experience so far, however, shows that many developing countries need help before they can participate. The international systems are incomplete and less effective than they might be, because of weakness at the national level. For a system as a whole, this is the more serious the more transferable is the information from one country to another.

For an individual country, a much more serious situation is hidden behind this obvious statement. If a country cannot participate in AGRIS, it is most unlikely to have its own agricultural literature under control. True, much of the agricultural information it needs to support its programs must come from outside - if this were not so, there would be no need for AGRIS at all - but it is the home-produced literature thatis most important for national planning. Without it, the country cannot see the results of its own investment

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in agricultural research, training, extension, and development. And so it is with all other literature, whether there is a corresponding international system or not. It is the national literature that is most important for national planning.

National information policies, national information systems, and inventories of the information produced within national boundaries are one answer, though one that has not been adopted in many Western countries. For them the situation is complicated by an intricate jigsaw of private, public, and governmental organizations handling information in one form or another. On the other hand, many developing countries have a greater need for nationally directed information activities than do developed countries where there is a considerable information flow, but their very lack of an information infrastructure makes a national information policy and system easier to contemplate. Unesco has recognized this in adopting a major program (NATIS) to encourage the building of national structures.

Within the restriction that we are not a bilateral technical assistance agency, we have also recognized the importance of this area and have recently begun a modest program to help strengthen national infrastructures. The first project approved has been a two-year

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project in Bolivia for the establishment of a comprehensive national information program. The main objectives are to help the nation define its information policy, build its network of information services, and devise a strategy for their use, and at the same time to serve as an example for our own program. In working out the project, we have developed certain criteria for national projects of this type that differ from those for research. The government at the highest level must recognize the need for an information policy and program, be ready to give it high priority, and back it with funds much larger than the IDRC contribution. There is a good reason for this; external aid can be invaluable in starting activities moving but sooner or later it must end, and the country must assume total financial responsibility. Training is an essential activity but may be wasted if not focussed, and we therefore directly relate it to the activities the trainees will subsequently perform. For example, the training of national centres related to the regional AGRIS centres is specifically intended to help the staff participate in AGRIS and not to give refresher courses in librarianship.

The criteria we have developed for our support are not inconsistent with the essential components identified by Unesco for a national policy. We hope that much will be learned from the Bolivian

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experience that can be applied by the donors of technical assistance in the general boosting of national information activities in developing countries.

CONCLUSION

(To be written later)